REMARKS

Upon entry of this Amendment, claims 1-49 are all the claims pending in the application. Claims 40-49 have been added. Claims 5, 11-20, 23-25 and 27 are withdrawn from consideration as being drawn to a non-elected invention. Applicant thanks the Examiner for allowing claim 28 and for acknowledging allowable subject matter in claims 2, 3, 6, 7, 9, 10 and 21, which are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form.

In regard to the rejected claims, claims 35 and 37 are rejected under 35 U.S.C. § 112, first paragraph; claims 29 and 35 are rejected under 35 U.S.C. § 102(b) as being anticipated by McCool et al. (USP 4,238,746); and claims 1, 4, 8, 22, 26, 30-34, 38 and 39 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Chiu et al. (USP 4,539,689) and further in view of McCool et al. (USP 5,238,746).

For the reasons set forth below, Applicant respectfully traverses the rejections and requests favorable disposition of the application.

Rejection of Claims 36 and 37 Under 35 U.S.C. § 112, ¶1

In regard to the §112, first paragraph, rejection of claims 36 and 37, the Examiner contends that the application, as filed, does not support the requirement of positive and negative half cycles of a carrier signal being used to determine an optimum noise estimate. In response, although Applicant respectfully disagrees, Applicant has amended claims 36 and 37 to expedite prosecution of the application. Specifically, claim 36 has been broadened to only recite that a "carrier signal is used to determine which signal sample corresponds to a minimum residual

noise effect." Claim 37 has been similarly broadened. Support for the respective subject matter of claims 36 and 37, as presently claimed, is found generally at page 2, lines 6-10 and more specifically at page 22, line 21 through page 23, line 11, page 4, lines 15-18 and in claims 18 and 19, in the specification as originally filed. Since the apparent offending language has been deleted from the claims, withdrawal of the rejection of claims 36 and 37 under 35 U.S.C. §112, first paragraph, is kindly requested.

Rejection of Claim 1 Under 35 U.S.C. § 112, ¶2

In regard to the §112, second paragraph, rejection of claim 1, the Examiner contends that the application does not support the requirement that the noise-reduced signal exhibits a reduction in ***any type*** of noise. In response, Applicant has amended the claim to recite a reduction in "the overall system noise" instead of a reduction in "any type of noise". Support for this amendment is found throughout the specification and particularly at page 5, line 11 through page 6, line 6.

Rejection of Claim 29 as being anticipated under 35 U.S.C. § 102 by McCool et al.

In regard to the §102 rejection of claim 29, the Examiner contends that McCool et al. employs a wide system bandwidth. Apparent support for this contention is found at Col. 12, lines 1-9 in McCool et al., where it is asserted that multiple channels are used. Applicant respectfully disagrees and submits that McCool et al. discloses an inherently "narrowband" system as compared to the system that is both disclosed and claimed in the present application. In any event, Applicant has amended claim 29 merely to clarify that which was already implicit in the claim.

More particularly, McCool et al. discloses a transversal filtering method that employs a plurality of narrowband filters. For example, at column 3, lines 2-7, McCool et al. discloses "[w]hen the input waveform consists of a set of non-interacting narrowband signals superimposed on a white noise input signal, the enhancer constructs a set of narrowband filters whose passbands are centered about each of the narrowband input signals." Indeed, a combination of several of the filters disclosed in McCool et al., in the aggregate, might result in a wider potential reception band. However, because the system in McCool et al. explicitly utilizes narrowband filters, it is inherently a narrowband system and not an inherently wideband system as that term is used in regard to the system disclosed and claimed in the present application.

Specifically, claim 29 recites, *inter alia*, "a means for receiving signals across an entire wide continuous system bandwidth." As described above, the system in McCool et al. explicitly does not, and can not, include receiving signals across an entire wide ***continuous*** system bandwidth because it, instead, uses a set of transverse filters, each with its own respective finite passband. Accordingly, the prior art of record does not teach or suggest a *means for receiving* as set forth in claim 29 and, thus, the claim is patentable over the prior art of record.

Rejection of Claim 35 as being anticipated under 35 U.S.C. § 102 by McCool et al.

Claim 35 recites, *inter alia*, "providing a sequence of ***at least two related iterative processes***, each related to a single receive signal of the receive system." For example, as disclosed at page 21, lines 11-15, parallel processing helps expedite achieving the iterative result. In McCool et al., for example at FIG. 2, and in its attendant description in the specification, a single iterative process corresponding to a single receive signal is disclosed. Accordingly, the

prior art of record does not teach or suggest all the requirements set forth in claim 35 and, thus, the claim is patentable over the prior art of record.

Rejection of Claims 1, 4, 8, 22, 26, 30-34, 38 and 39 as being rejected under 35 U.S.C. § 103(a)as being unpatentable over Chiu et al. in view of McCool et al.

Applicant maintains that a skilled artisan would not have been motivated to look to, let alone combine, the independent teachings of Chiu and McCool et al. to achieve the solution to the problem addressed by the present invention. Specifically, the present inventor has sought, and has discovered, an inherently wideband solution to increasing the signal-to-noise ratio for wireline communication applications. Moreover, the present invention explicitly avoids a costly and time-consuming filtering scheme as previously used in conventional art systems. Specifically, as described in the present specification at page 8, lines 13-15, a result of the present invention is "to obtain signal-to-noise improvement substantially beyond that achieved by merely averaging noise samples and applying the average to a matched filter."

Applicant submits that Chiu and McCool et al. both represent precise examples of the type of prior art system the present invention avoids. That is, both Chiu and McCool et al. disclose filtering schemes in which the receive signal is processed to obtain tap constants for a narrowband filter. In particular, McCool et al. discloses:

> An input signal X(j) is fed directly to the positive port of a summing function and is simultaneously fed through a parallel channel in which it is delayed, and passed through ***an adaptive linear transversal filter***, the output being then subtracted from the instantaneous input signal X(j). The difference, X(j)-Y(j), between these two signals is the error signal ε(j). ***ε(j) is multiplied by a gain μ and fed back to the adaptive filter to readjust the weights of the filter.***
>
> (abstract, emphasis added)

Chiu, similarly, discloses:

> The equalizer employs ***a transversal filter*** under control of a microprocessor. Samples of in-phase and quadrature phase components of the received impulse response are cross correlated and autocorrelated to form elements of a complex matrix equation describing the optimum equalizer tap settings. The microprocessor performs a special iterative [sic] operation utilizing elements of this equation ***to rapidly and exactly calculate the optimum initial settings for the tap constants***.

(abstract, emphasis added)

Because the asserted prior art references represent the particular type of conventional art system that the present invention explicitly seeks to avoid, one skilled in the art and presented with the problems addressed by the present invention, that is, a broadband receive method and system that does not require spectral filtering, would not have even consulted the teachings of Chiu and McCool et al. For at least this reason, the proposed combination of Chiu and McCool et al. is inappropriate for §103 purposes.

Moreover, however, even if Chiu and McCool et al. were combined as proposed by the Examiner, the specific requirements of the present claims would not be achieved. Specifically, claim 1 requires, *inter alia*, "performing an iterative process on data contained in the matrix, wherein ***the iterative process converges to an estimate of the magnitude and polarity of only the noise portion*** of the signal-plus-noise for each trial." Neither McCool et al. nor Chiu either teach or suggest this feature. As described above, the result of the respective iterative processes in Chiu and McCool et al. is a signal for which the noise has been, theoretically, canceled as a result of iterative filtering and filter tap adjustments. Accordingly, the proposed combination does not teach all of the required elements of claim 1 and, thus, claim 1 and all claims dependent

thereon, specifically, claims 2-4, 6-10, 21, 22, 26, 30-34, 38 and 39, are patentable over the proposed combination of Chiu and McCool et al.

In addition to its dependence from allowable claim 1 as discussed above, claim 4 recites independently subject matter in that the proposed combination of Chiu and McCool et al. fails to teach or suggest the claimed "several iterations produce an estimate of a ***noise only*** portion of the signal-plus-noise by algebraically summing resultant values of the several iterative steps." Accordingly, claim 4 is patentable for this additional reason.

Patentability of New Claims

For additional claim coverage merited by the scope of the invention, Applicant has added new claims 40-49. Applicant submits that the prior art does not disclose, teach, or otherwise suggest the combination of features contained therein. For example, new claim 40 represents previously presented, and allowable, claim 2, rewritten in independent form; new claim 41 represents previously presented, and allowable, claim 7, rewritten in independent form; and new claim 42 represents previously presented, and allowable, claim 3, rewritten in independent form. New claims 43-45 depend from allowed claim 28. Lastly, new claims 46-49 each requires, *inter alia*, "a receiver operable to simultaneously receive signals from across an entire continuous broadband frequency spectrum." None of the prior art references of record teach or suggest this feature.

Further Response to Examiner's "Response to Arguments"

In response to the Examiner's comments provided in the "Response to Arguments" section of the instant Office Action, Applicant provides the following description/comments

regarding the present invention to help clarify the differences between the claimed invention and the prior art.

Applicant respectfully submits that the invention disclosed and claimed in the present application is indeed "inherently broadband" as opposed to the conventional art, specifically the art disclosed in Chiu and McCool et al. Specifically, Applicant chose deliberately to avoid filtering and, rather, chose to take advantage of the "digital" approach using stored information. The Topological Number Array (TNA) disclosed and claimed is inherently broadband because it uses no filtering whatsoever. In accordance with the claimed invention , many channels can have their respective S/N ratios simultaneously enhanced and can operate over an entire intermediate frequency carrier bandwidth to achieve higher channel capacity. Apparent from the present specification, the titled invention, "method and means for increasing inherent channel capacity for wired network" derives inherently from the fact that no filtering is used, nor described.

The present invention provides additional channel capacity in part due to the expanded bandwidth, while at the same time improving the signal to noise ration throughout this increased bandwidth. These characteristics provide a S/N times bandwidth product that can be made approximately two orders of magnitude (e.g., 30dB) higher. These results have been achieved in simulated models of the claimed TNA. An improvement such as this is particularly useful in reducing signal acquisition "access time" which is a significant problem for wire.

It should also be recognized that the departure from real-time, e.g., the latency, in the process of the present invention is made tolerably small when a carrier signal is used. This

latency can be reduced to as small as two successive half cycle trials that can be accomplished in an extremely short period of time, e.g., nanoseconds. Further, the amount of storage necessary to retain the information needed is as small as that which is needed for one cycle period at the carrier frequency.

A unique characteristic of Applicant's invention is its ability to initially "detect the signal". This is a well-known challenge in virtually all communication systems. It is much easier to improve the S/N ration, such as by narrow-banding (integration), after the signal has been detected. The ability to detect a "weak" signal is much more difficult when no apriori information is known, such as an "impulse" signal transmitted prior to the data. See e.g., Chiu reference. Therefore, the present invention is distinguishable from the prior art of record at least because the present invention operates on data prior to detection where the Chiu and McCool et al. references are directed to methods using after-detected data. Accordingly, by operating on data prior to detection, the present invention is able to simultaneously and automatically enhance the channels over an entire bandwidth. Thus, in accordance with the claimed invention, the need to isolate on a specific desired channel, for example as needed in systems employing transversal filtering, is avoided. As demonstrated in various simulations, by operating on the entire bandwidth simultaneously, the present invention is able to achieve S/N improvement of 20dB or more.

The Examiner appears to understand the term "broadband" as claimed in the present application as being limited to a broadband signal. However, the present invention utilizes broadband "noise" because large amounts of such noise can be virtually eliminated over the

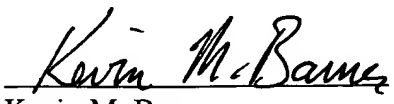
complete intermediate frequency (IF) carrier band, in accordance with the claimed invention. This is much more noise than can be eliminated by the narrow band of each individual channel of a transverse filter. The simultaneous availability of noise reduction satisfies the detection requirement, discussed previously, because it is available simultaneously at any and all signal channels where each involves a carrier cycle to provide a digital estimate of the noise.

Conclusion

In view of the foregoing amendments and remarks, the application is believed to be in form for immediate allowance with claims 1-4, 6-10, 21, 22, 26 and 28-49, and such action is hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, he is kindly requested to **contact the undersigned** at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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